5.10. Postflight Data Deliverables

- All CCD sample pictures and associated metadata with timestamps and voice annotations of interesting features.
- History of various setting, such as, camera settings (and a note of when and what changes occur in these settings).
- SAMS data if readily available (gravitational acceleration monitoring) in a useful format (*e.g.*, a graphical plot instead of CDs of acceleration data would help us in making use of acceleration information).
- Immediate access to samples: all samples (if available), for further studies at the PI labs, as soon as samples return from orbit, or as soon as possible. It is the glassy volume fraction PMMA samples that are likely to survive the accelerations of a space shuttle reentry. By homogenizing either the top or bottom half of the sample and letting it stand, it can be clearly demonstrated that the same sample crystallized in microgravity and not on earth, even with a crystallized surface to initiate crystallization. Not only is such a sample of scientific significance, but the results of this very significant demonstration should be sent to a museum.

5.11. Mission Success Criteria for BCAT-5

Complete success is the achievement of all of the science requirements. This means that there will be sufficient information to provide a crosscheck of all data and calculated factors.

Processing, manipulation and characterization of the samples in microgravity are as important as the measurements during the experiments themselves. For example, sample homogenization is essential to conduct of any of the flight experiments. This allows for the dissolution of the crystallites or structures that have formed in 1-*g* before launch, and provides a proper starting point in microgravity.

Success Level	Accomplishment
Minimum Success	• Homogenize and photograph all of the ten samples at least twice (Req.5.1) – all the high ϕ colloidal particle samples and all the colloidal phase separation samples. This includes a photograph of each sample right after is has been homogenized to ensure this is indeed the case and another photograph several weeks or more later to capture the equilibrium state of the sample.
Significant Success	• Homogenize and photograph all ten samples for at least one homogenization photo and three photo sessions (Req.5.1) – all the high ϕ colloidal particle samples and all the colloidal phase separation samples.

Complete Success	• Homogenize and photograph all ten samples using EarthKAM to capture the kinetics (time evolution) of the samples (Req.5.1) – all the high ϕ colloidal particle samples and all the colloidal phase separation samples. The samples should be returned to earth if any of the concentrated ("glassy") samples crystallize since these crystals will likely survive re-entry.

6. Test Matrix

The current plan for this experiment is to conduct it over five, three-week sessions, each of each can be run incrementally and will require 4 to 5 hours of crew-time; and a sixth session at six months, which is slotted to take about an hour of crew-time. As such, new information will undoubtedly be learned, and the nature of the experiments conducted will evolve to take advantage of this new information. As a result, it is essential to allow the PIs as much flexibility with the experiment as possible. The test matrices should be viewed as representative of the sort of experiments that will be conducted and can be found in detail in Section 5.8, which is titled "Astronaut Involvement".

7. Principal Investigators' Requests

7.1.Research Equipment

Preflight

We would greatly benefit by having an exact replica of the entire BCAT-5 apparatus to facilitate further development of procedures and techniques on the ground and to enhance communication with the astronauts actually performing our experiment. Therefore, having a complete set (sample chamber, all holders, camera, and laptop) of apparatus for the duration of the experiment exactly mirroring what is currently onboard ISS would significantly increase the chance of scientific breakthroughs and the success of this experiment.

Because the development of our experiment has benefited greatly from the use of tools primarily proposed for other uses onboard the ISS, we would also like to have a list of the available equipment (*i.e.*, not critical components that cannot be moved) that might be potentially used to assist our experiment. For instance, the use of the EarthKAM system has radically improved the quantity and quality of our data. We expect that further improvements could be conceived, and thus would appreciate a list of accessible equipment.

Postflight

Optional access to the flight samples and a functional engineering model of the equipment could allow some of the observations to be tested, and the conditions to be repeated on the ground. This may prove important in interpretation of the data obtained.

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